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A NEW GENERIC ASSIGNMENT FOR A SOUTH AMERICAN CRAYFISH (DECAPODA: PARASTACIDAE) WITH REVISED DIAGNOSES OF THE SOUTH AMERICAN GENERA AND COMMENTS ON THE PARASTACID MANDIBLE

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Abstract.—A new monotypic genus, *Virilastacus,* is proposed to receive the disjunct species *Parastacus araucanius* Faxon (1914), which in 1971 was assigned by Riek to the genus *Samastacus.* For comparative purposes, illustrations of the salient features of this crayfish and of the sole member of *Samastacus, S. spinifrons* (Philippi, 1882), are provided, as is a redescription of *Virilastacus araucanius.* Similarities and differences between them and two sympatric members of the genus *Parastacus* are summarized. Diagnoses of the three genera of South American Parastacidae are provided along with comments on mandibular features.

A draft of this manuscript was completed in 1987, and copies were circulated among students of the Parastacidae (see "Acknowledgments") for their perusal. Before I received their comments, I learned from Dr. Ludwig Buckup that he had just submitted a manuscript treating the South American crayfishes on the Pacific versant. Moreover, he stated that he had found additional specimens of *Samastacus araucanius* (Faxon, 1914) in the Museum of Zoology, Hamburg, Germany, that were being described. Without notifying Dr. Buckup of my having duplicated, at least in part, his effort, my manuscript was filed awaiting the appearance of his publication. A recent letter from him revealed that the manuscript is still in press.

In the meantime, I found that I had overlooked an abstract published by Jara (1983) announcing the discovery of a second locality for this crayfish and a suggestion that it should perhaps be assigned to a new genus. The latter was amplified by Rudolph & Rivas (1988), who also provided an illustration of the phallic papillae and coxae of the fourth and fifth pereiopods. C. G. Jara, who has donated two specimens of this species to the Smithsonian, recently read this manuscript and has encouraged me to offer it for publication. While the common possession of certain features suggests closer affinities between *Samastacus araucanius* and *S. spinifrons* than those binding either to the species currently assigned to the genus *Parastacus,* there are so many distinctive features (see "Diagnosis," Table 2, and illustrations) exhibited by these two species now assigned to *Samastacus* that they must have shared only a very remote common ancestry. In recognition of this opinion, which is shared by Jara (1983) and Rudolph & Rivas (1988), I propose that Faxon's *Parastacus araucanius,* redescribed and illustrated herein, be assigned to a new, monotypic genus. Included also are modifications of the diagnoses of the genera *Parastacus* and *Samastacus* presented by Hobbs (1974).

Parastacus Huxley, 1879

Parastacus Huxley, 1879:759, 771 [Type species, by subsequent designation (Faxon, 1898:683): *Astacus pilimanus* von Martens, 1869:15. Gender: masculine.]

Diagnosis.—Carapace lacking spines and tubercles and with or without postorbital ridges; anterolateral part of branchiocardiac groove often hardly distinguishable because of closely approximating deeply impressed cervical groove, 2 usually merging dorsolaterally; viewed dorsally, cervical groove somewhat V-shaped except in *P. laevigatus*; postorbital ridge ranging from well developed to virtually obsolete. Abdomen without tubercles or spines; pleuron of first abdominal segment distinct and partly overlapped by that of second. Telson entirely, sometimes weakly, calcified; without transverse suture but with dorsomedian longitudinal sulcus (sometimes rudimentary). Third maxilliped with mesial half of ventral surface of ischium bearing setiferous punctations; exopodite reaching, or slightly overreaching, basal part of merus. Caudal molar process of mandible mostly bicuspide, but tricuspide in *P. saffordi* and quadricuspide in *P. varicosus* in which nodular cusp located on proximal side of cuspal triangle. Chela with ventrolateral margin smooth or bearing small tubercles; when upper surface of carpus of cheliped held in horizontal plane, dactyl moving subvertically; carpus with or without spiniform tubercles. Male genitalia consisting of fixed, slightly elevated ventromesial ridge bearing noncalcified phallic papilla; male cuticle partition (see Morgan, 1986) present; all members with at least rudiments of male and female genital apertures. Branchial count 20 + epr + r, or 20 + ep + r (podobranchs on segments VIII–XIII; anterior arthrobranchs on VIII–XIII; posterior arthrobranchs on IX–XIII, that on 13 rudimentary; pleurobranchs on XI–XIV; and epipodite on VII bearing few branchial filaments). Lateral processess of sternite XIV contiguous along at least part, often much, of their length, separated by short or long fissure.

Species.—*Parastacus brasiliensis* (von Martens, 1869:16), *P. defossus* Faxon (1898: 686), *P. laevigatus* Buckup & Rossi (1980: 677), *P. nicoleti* (Philippi, 1882:624), *P. pilimanus* (von Martens, 1869:15), *P. pugnax* (Poeppig, 1835:314), *P. saffordi* Faxon (1898:683), and *P. varicosus* Faxon (1898: 685) (see Hobbs 1989, for most recent summary of synonymies and ranges).

Samastacus Riek, 1971

Samastacus Riek, 1971:134 [Type species, by original designation, *Astacus spinifrons* Philippi, 1882:687. Gender: masculine].—Hobbs, 1974:26.

Diagnosis.—Carapace punctate or smooth; anterolateral part of branchiocardiac groove extending subparallel to cervical groove, 2 merging laterally; viewed dorsally, cervical groove broadly U-shaped; postorbital ridge well developed, terminating anteriorly in spine or tubercle. Abdomen without spines or tubercles; pleuron of first abdominal segment distinct and partly overlapped by that of second. Telson entirely calcified, without transverse suture and dorsomedian longitudinal sulcus. Third maxilliped with setiferous punctations over entire ventral surface; exopodite reaching, or slightly overreaching distal extremity of ischium. Caudal molar process of mandible quadricuspide with nodular cusp on distal side of cuspal triangle. Chela with ventrolateral margin smooth; when upper surface of carpus of cheliped held in horizontal plane, dactyl moving subhorizontally; carpus without enlarged spiniform tubercles mesially and ventrally. Male genitalia consisting of articulated, slender, tubular, calcified projections, which shorter than length of widely separated coxae; latter with male cuticle partition; individuals never with even rudiments of both male and female genital apertures. Branchial count: 20 + ep + r. Sternite XIII with median, caudally pro-

jecting, digitiform element. Lateral processes of sternite XIV widely separated.

Species.—*Samastacus spinifrons* (Philippi, 1882:627). See Figs. 1 and 3g.

Virilastacus, new genus

Parastacus.—Faxon, 1914:353 [in part]. *Samastacus* Riek, 1971:135 [in part].

Diagnosis.—Carapace lacking spines, tubercles, and postorbital ridges; anterolateral part of branchiocardiac groove distinctly separated from the subparallel to cervical groove along upper third of height of carapace; viewed dorsally, cervical groove weakly V-shaped and not deeply impressed. Abdomen lacking spines and tubercles; pleuron of first abdominal segment distinct and partly overlapped by that of second. Telson with no trace of transverse suture and entirely calcified; posterior half with dorsomedian longitudinal sulcus. Ventral surface of ischium of third maxilliped with median longitudinal band of tubercles and mesial half bearing tufts of stiff setae; distolateral extremity of podomere rounded, not produced; merus without spines and tubercles; exopod reaching distal extremity of merus. Caudal molar process of mandible quadricuspide; nodular cusp situated on proximal side of cuspal triangle. Chela with palm almost entirely tuberculate, lacking spines or large tubercles; ventrolateral margin tuberculate to weakly subserrate; when upper surface of carpus held in horizontal plane, dactyl moving obliquely, neither subvertically nor subhorizontally; carpus of cheliped lacking enlarged tubercles mesially and ventrally. Male genitalia consisting of articulated, slender, tubular, semi-rigid phallic papilla which longer than length of, and extending anteriorly from, narrowly separated coxae which lacking male cuticle partition (see Morgan, 1986:7); never with both male and female genital apertures. Sternite XIII with cephalically cleft median plate posteriorly. Lateral processes of sternite XIV separated in caudal aspect by distinct vertical fissure.

Type species.—*Parastacus araucanius* Faxon, 1914:353.

Gender.—Masculine.

Etymology.—L. *virilis* = manly; so-named because of the comparatively long phallic papillae.

Virilastacus araucanius (Faxon, 1914), new combination
Figures 2, 3a, j, l, m

Parastacus araucanius Faxon, 1914:353–354, 406, plate 4 [Holotype: Museum of Comparative Zoology 7355 (♂). Type locality: Corral, Chile].—Van Straelen, 1942:9.—Holthuis, 1952:84.—Bahamonde, 1958:186.—Bahamonde & López, 1963:126, 127.—Castro, 1966:11, 17.—Riek, 1971:135.—Jara, 1983:R-163.
Samastacus araucanius.—Riek, 1971: 135.—Manning & Hobbs, 1977:159.—Buckup & Rossi, 1986:54.—Rudolph & Rivas, 1988:73–78. fig. 1.—Hobbs, 1989: 80, fig. 127.

Description of holotype.—Rostrum (Fig. 2, b, d, i) short, constituting 11.2% of carapace length, with smooth, weakly convergent lateral carinae; lateral margin (= subrostral ridge) evident in dorsal view to near tip of rostrum; dorsal surface excavate anteriorly grading to subplane posteriorly. Postorbital ridges obsolete. Suborbital angle prominent although rounded apically. Mandibular arc conspicuously elevated, but lacking tubercles along ventral margin. Branchiostegites punctate dorsally, granulate ventrally; cervical and branchiostegal spines absent; anteroventral branchiostegal region studded with very small squamous tubercles. Areola (Fig. 2f, i) 1.9 times as long as wide, constituting 32.0% of carapace length and 35.8% of postorbital carapace length.

Basal podomere of antennular peduncle with strong median spine slightly proximal

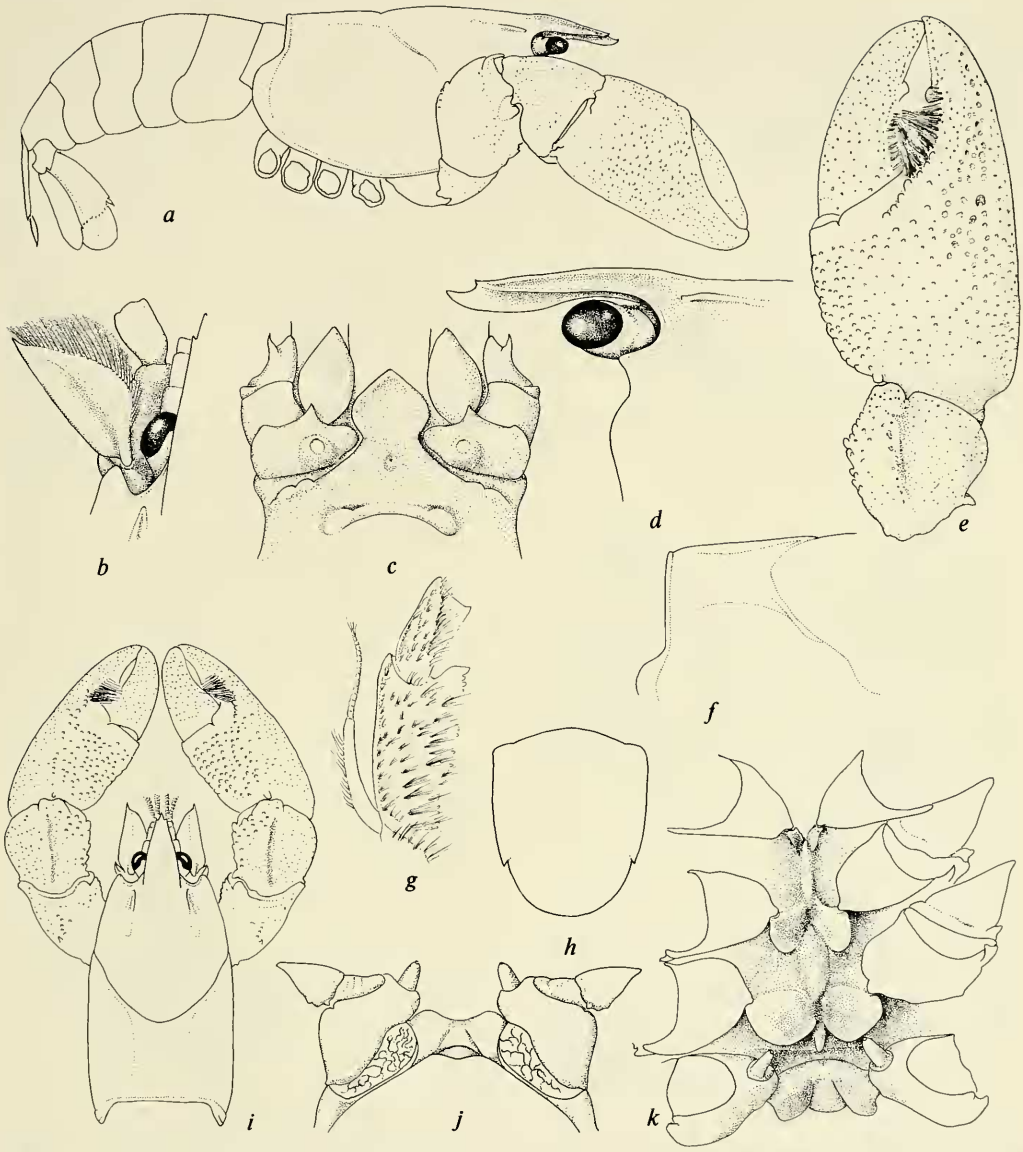

Fig. 1. *Samastacus spinifrons* from Los Cuartos, Bío Bío Province, Chile. a, Lateral view of body with ambulatory appendages removed; b, Dorsal view of antennal scale and adjacent structures; c, Epistome and base of antenna; d, Lateral view of cephalic region; e, Dorsal view of distal podomeres of cheliped; f, Dorsolateral view of cardiac and gastric regions of carapace; g, Ventral view of ischium, merus, and exopod of right third maxilliped; h, Dorsal view of telson; i, Dorsal view of carapace and chelipeds; j, Caudal view of basal podomeres of fifth pereiopods and adjacent structures; k, Ventral view of sternal region.

to midlength. Antennal peduncle with obtuse submedian tubercle and weak lateral elevation on distal margin of coxa (Fig. 2c), otherwise without spines or tubercles. Antennal scale (Fig. 2b) broad and short, widest distal to midlength, and with single distolateral spine reaching base of ultimate podomere of antennular peduncle; flagel-

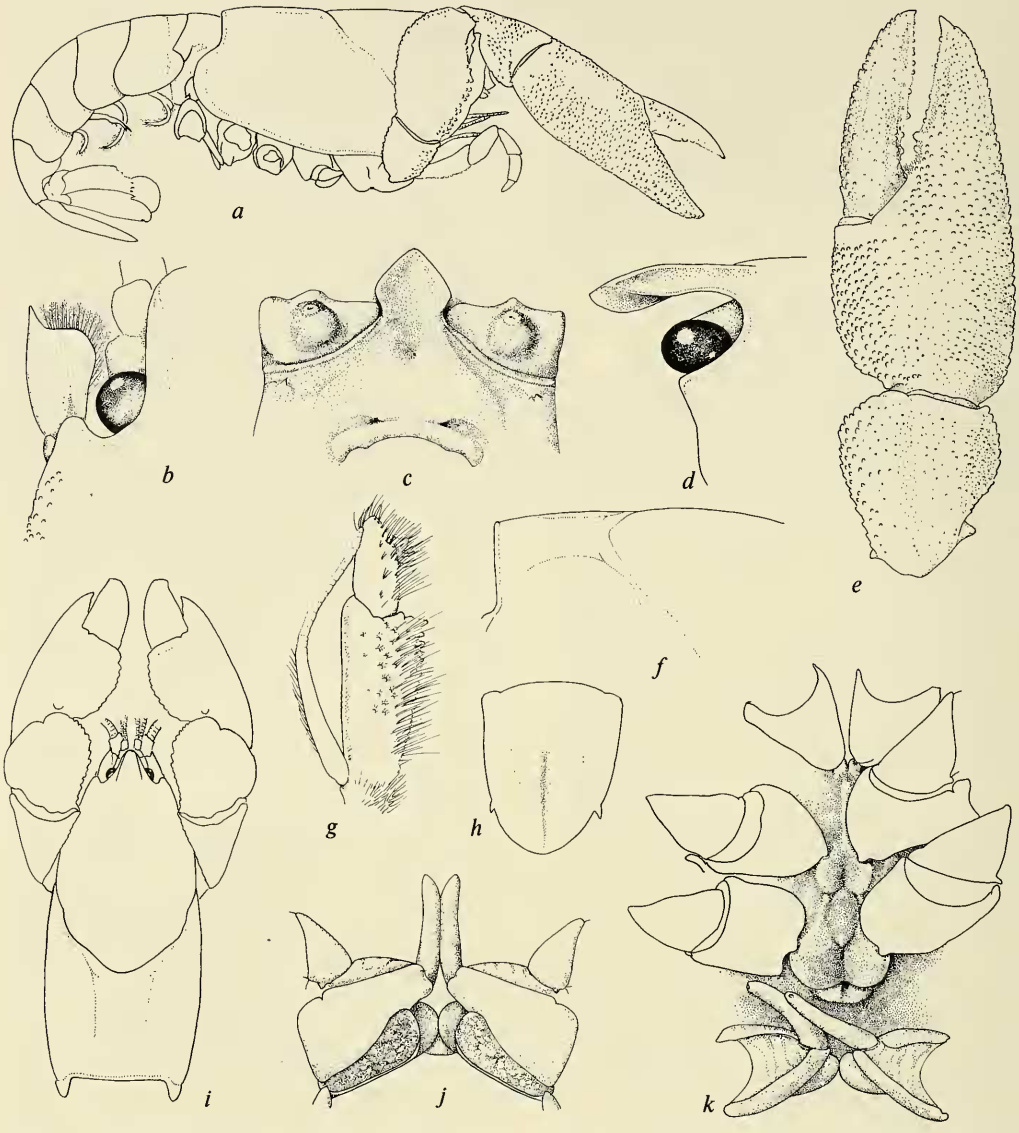

Fig. 2. Holotype of *Virilastacus araucanius*. a, Lateral view of body with ambulatory appendages removed; b, Dorsal view of antennal scale and adjacent structures; c, Epistome and base of antenna; d, Lateral view of cephalic region; e, Dorsal view of distal podomeres of cheliped; f, Dorsolateral view of cardiac and gastric regions of carapace; g, Ventral view of ischium, merus, and exopod of right third maxilliped; h, Dorsal view of telson; i, Dorsal view of carapace and chelipeds (left cheliped in specimen regenerated, mirrored image of right one depicted here); j, Caudal view of basal podomeres of fifth pereiopods and adjacent structures; k, Ventral view of sternal region.

lum of both antennae broken. Mandible with both cephalodistal and proximocephalic cusps sclerotized and contiguous to cephalic molar process, and smaller sclerotized distoproximal cusp somewhat removed from them; arrangement resembling that illustrated for *Euastacus yarransis* (McCoy, 1888:225) by Hobbs, 1987: fig. 3a. Ischium of third maxilliped (Fig. 2g) not produced distolaterally; clusters of setae on mesial

Table 1.—Measurements (in mm) of *Virilastacus arauncanius*.

Structure	Holotype ♂	Valdivia ♂	Valdivia ♀	Hualqui ?*	Hualqui ♂*
Carapace					
Length	18.8	24.0	20.4	26.0	19.0
Postorbital length	16.8	**21.5	18.0	?	?
Areola					
Length	6.0	**7.7	6.8	8.4?	7.8
Width	3.2	?	3.0	4.0	4.3
Chela					
Length	14.8	23.6	15.6	26.4	23.7
Palm width	7.1	11.9	8.7	12.8	12.8

* Data from Rudolph & Rivas (1988).
** Extrapolated from proportions in female; see text.

sector stiff; merus without spines and tubercles mesially and laterally.

Epistome (Fig. 2c) with small cluster of tubercles anterolaterally, one of dextral members spiniform, and submedian fovea posterior to subtriangular anteromedian lobe, latter with smooth margins.

Keel of sternite XIII (Fig. 2k) with cephalically cleft median plate posteriorly [perhaps homologous to bullar lobes in some members of *Astacoides* (see Hobbs 1987:fig. 5)]. Median keel of sternite XII not inflated, that of XIII strongly so. Lateral processes of sternite XI small and directed ventrally, those of sternite XII disposed at approximately 90° to one another, and those of sternite XIII, at about 12°. Vertical arms of paired sternopleural bars of segment XIV widely separated, clearly exposing lateral processes separated by median fissure; bullar lobes not differentiated.

Cheliped (Fig. 2a, e, i) with mesial border of ischium studded with small tubercles. Ventral surface of merus with 2 lateral, sublinear, longitudinal series of about 8 tubercles each (others flanking rows), and single mesial row of about 12 smaller tubercles; dorsal surface also bearing distally-broadening band of small tubercles, none conspicuously larger than others nearby, and none spiniform; dorsodistal margin smooth, not crenulate. Carpus with mesiodistal subcristiform row of five or six small tubercles, podomere mostly tuberculate, largest tubercles along ventral part of distal margin; median depression on dorsal surface very shallow. Propodus width 48% of length, tubercles on lateral surface extending onto finger where dividing into 2 rows separated by series of conspicuous punctations; mesial surface of palm studded with tubercles. Opposable margin of fixed finger with single row of minute denticles flanked proximodorsally by 2 rather conspicuous tubercles followed by broken series of 6 smaller tubercles more distally; ventral flank with row of 6 small tubercles along distal half of finger (not visible in Fig. 2e). Dactyl tuberculate mesially; opposable margin with single row of minute denticles flanked dorsally by row of 10 small tubercles and single larger tubercle ventrally, latter occupying gap between second and third tubercles of dorsal row. Ventromesial surfaces of both fingers punctate with moderate clusters of setae basally.

Pleura of abdominal segments as illustrated (Fig. 2a), lacking tubercles and spines. Telson (Fig. 2h) heavily calcified, setose, punctate dorsally with caudomedian longitudinal sulcus and single pair of fixed marginal spines; no trace of transverse suture evident. Proximal podomere of uropod lacking spines and tubercles; mesial ramus

with well defined median carina bearing premarginal distal spine, and lateral margin also with single fixed spine. Lateral ramus with median keel and row or 10 spines on proximal side of diaeresis. Lateral angle of anterior section (probably injured in earlier instar) lacking spines on left member, right with 1 fixed marginal spine and broken articulated one and fixed one mesial to it.

Phallic papillae (Fig. 2j, k) tubular and long, extending anteriorly from ventral anteromesial angle of coxa, and reaching distinctly anterior to ventral articular condyle of coxa of fourth pereiopod when fifth pereiopods pressed anteriorly.

Male from Valdivia.—(The carapace of this specimen is crushed and the entire dorsal part of the thoracic region is missing. The carapace dimensions cited are extrapolated on the basis of the length of the cephalic region, the dorsal part of which is entire, in comparison with that of the female from the same locality.) Differing from holotype in following respects: Antennal flagellum reaching second abdominal tergum. Mandible (Fig. 3a) essentially similar but 1 of 4 cusps on caudal molar process not observed in holotype. Epistome with anteromedian lobe more nearly sagittiform than triangular; plumose setae, made more conspicuous by adhering clay particles, on plane and marginal surfaces. Lateral processes of sternites XII and XIII splayed at angles of approximately 80° and 90° respectively. Cheliped with only 5 tubercles in more mesial of two lateral rows on ventral surface of merus; carpus more weakly tuberculate and many replaced by punctations, especially dorsolaterally; propodus width 50% of length. Chela (Fig. 3m) with punctations on lateral surface of fixed finger inconspicuous; opposable margin of fixed finger with small tubercle at base followed by massive, bifid one, and row of small tubercles extending distally from base of latter almost to corneous tip of finger; distal 4 tubercles of row flanked ventrally by row of recessed minute denticles and 4 more ventrally situated tubercles; opposable margin of dactyl with 2 tubercles in proximal concavity opposing bifid tubercle on fixed finger, and row of 10 tubercles continuing distally from concavity almost to corneous tip of finger. Undivided telson with pair of weak marginal tubercles and median longitudinal groove (Fig. 3l); lateral margin of uropod with 2 lateral spines and 9 or 10 in row on proximal flank of diaeresis.

Female from Valdivia.—Differing from holotype in following respects: Areola 2.3 times as long as broad, constituting 33% of carapace length, 38% of postorbital carapace length. Antennular peduncle lacking spine on basal podomere. Lateral processes of sternites XII and XIII not so strongly splayed. Width of propodus of right chela 55.8% of length. Tubercles on lateral surface of chela not so clearly arranged in rows and setiferous punctations not conspicuous. Opposable margin of propodus like that of Valdivia male except 6 tubercles present in more ventral distal row and setal cluster present proximal to massive tubercle; opposable margin of dactyl as in Valdivia male. Left chela much smaller than right, probably regenerated (?). Lateral ramus of uropod also like that of latter except 12 spines present on proximal flank of diaeresis.

Ovate oviducal apertures unremarkable.

Material examined.—Holotypic male, and a male and female from the Botanical Garden, Universidad Austral de Chile, Valdivia, collected 1 Dec 1983 by C. G. Jara. (See Table 1 for measurements.)

Observations on the mandible of South American parastacids.—The following observations are based on limited material and whether or not these remarks and accompanying illustrations are typical of the species must be confirmed. At least one mandible of each of the South American species, except those of *Parastacus laevigatus,* have been examined and are illustrated in Figure 3. The incisor lobe varies little, and the number of denticles ranges from 9 to 10; in all of them, except *P. nicoleti,* the antipen-

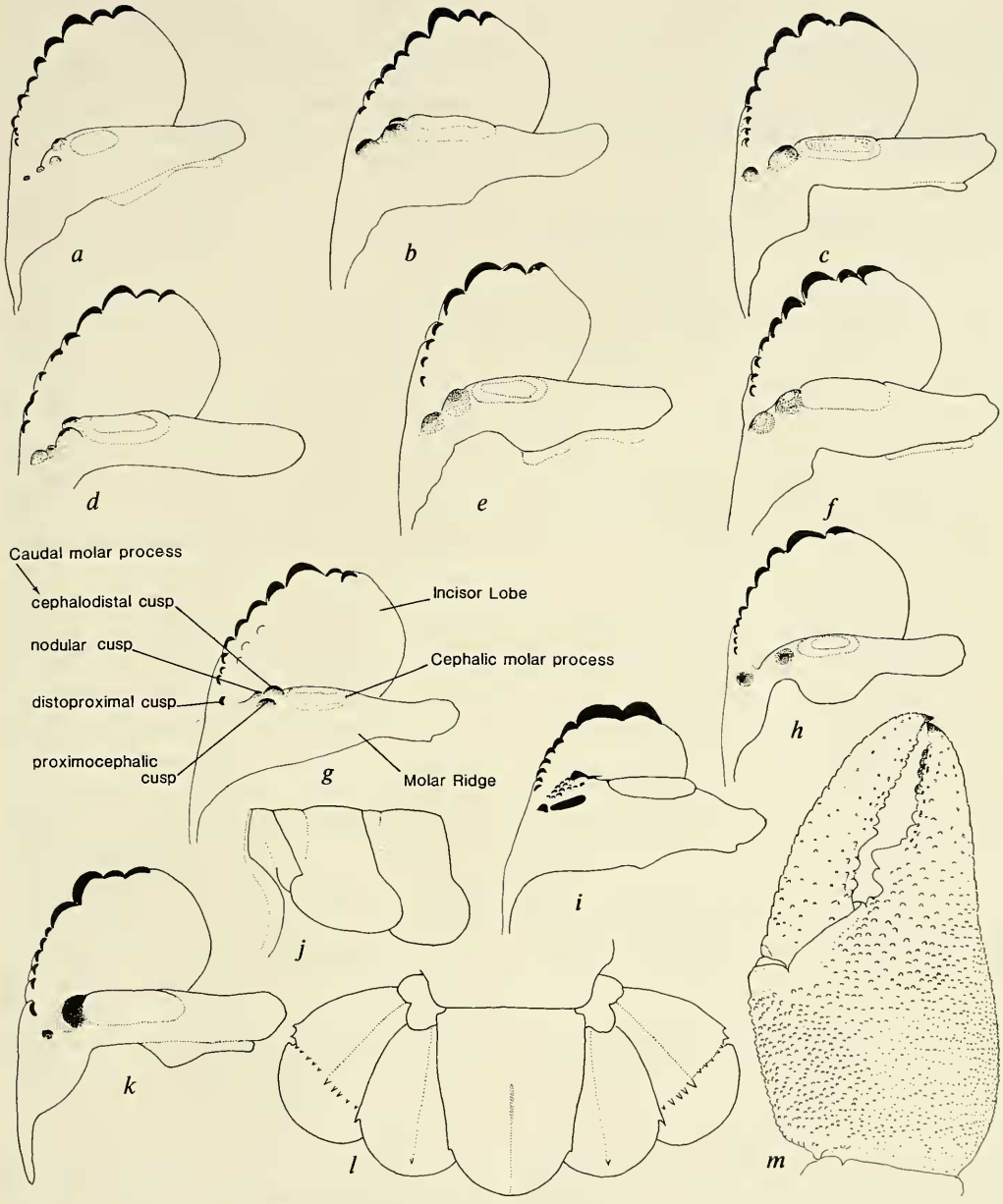

Fig. 3. Parastacid mandibles and features of male *Virilastacus araucanius* from Valdivia, Chile. (a–i, k, Caudal view of mandibles; j, Lateral view of anterior abdominal segments; l, Dorsal view of telson and uropods; m, Dorsal view of chela.) a, j, l, m, *Virilastacus araucanius*; b, *Parastacus saffordi*; c, *P. pugnax*; d, *P. varicosus*; e, *P. pilimanus*; f, *P. defossus*; g, *Samastacus spinifrons*; h, *Parastacus nicoleti*; i, *Astacoides granulimanus* (from Madagascar); k, *Parastacus brasiliensis*.

ultimate tooth is the largest. In the latter the penultimate is largest, as it is in all members of the genus *Astacoides* and in *Euastacus yarraensis* (McCoy, 1888) and *Astacopsis franklinii* Huxley (1879) (see Hobbs 1987: 11).

In all of the South American species the mandibles of which have been examined, the cephalic and caudal molar processes are, or are almost, contiguous. Only the caudal molar process exhibits possible noteworthy differences. In his study of the mandibles of the crayfishes of Madagascar, Hobbs (1987) employed the terminology proposed by Bouchard (1977) in his pioneering survey of mandibular features of holarctic crayfishes, introducing only one new feature that was termed the "nodular cluster" (referring to a group of cusps not known to exist in the caudal molar process of members of the Astacidae and Cambaridae). In attempting to homologize the mandibular features of the South American crayfishes with those of the holartic crayfishes and those of Madagascar, problems were encountered in attempting to identify the denticles in those that exhibited a variable quadricuspide caudal molar process and those that posessed a bicuspide one. A solution, seemingly reasonable to me, was reached in following the basic triangular pattern recognized by Bouchard in the Holarctic crayfishes: the side marked by the distoproximal and proximocephalic cusps as the proximal side of the triangle, and that between the distoproximal cusp and cephalodistal cusp, the distal. If the fourth cusp in the quadricuspide process is interpreted as representing a member of the "nodular cluster" of *Astacoides* than the "extra cusp" in *Virilastacus araucanius* and *Parastacus varicosus,* is a nodular cusp aligned on the proximal side of the cuspal triangle; in *Samastacus spinifrons* and *Astacopsis franklinii* the nodular cusp (perhaps another member of the nodular cluster) is aligned on the distal side of the triangle. Whether or not the nodular cusps occupying different sides of the cuspal triangle are homologous or represent retentions of different cusps in the nodular cluster remains to be demonstrated.

Perhaps speculations on the probable evolutionary sequence in the evolution of the cuspal triangle of the caudal molar process are premature, but I suggest that on the assumption that elements are more readily lost than gained, the most primitive condition of the caudal molar process occurs in the more generalized members of *Astacoides* (Fig. 3i) in which a cluster of nodular cusps lies within and on the distal side of the cuspal triangle. With the loss of all except two members of the nodular cluster that lie on the distal side of the triangle the condition found in *Astacopsis crosnieri* (see Fig. 3c in Hobbs 1987) is reached, and with the loss of one of these nodular cusps the cuspal composition of the caudal molar process of *Astacopsis franklinii* (see Fig. 3b in Hobbs 1987) and *Samastacus spinifrons* (Fig. 3g herein) has been attained. With the cephalic migration of the single nodular cusp to the proximal side of the cuspal triangle the pattern exemplified by *Virilastacus araucanius* and *Parastacus varicosus* has arisen, and with the loss of all of the nodular cusps the simple triangular caudal molar process exhibited by *Parastacus saffordi* and *Euastacus yarraensis* came into existence. As for the bicuspid caudal molar process, I suggest that a fusion of the two lateral elements of the cuspal triangle (cephalodistal and proximocephalic cusps) would account for the more lateral cusp of the bicuspid mandible characteristic of most members of the genus *Parastacus.* The possibility of the occurrence of such a fusion is perhaps strengthened by the large size of the lateral cusp in *P. brasiliensis* (Fig. 3k).

Remarks.—Rudolph & Rivas (1988:Table 1), in their study of *Virilastacus araucanius* presented measurements for what they termed the "Quela mayor" and the "Quela menor." This suggests to me that they consider the chelae of this crayfish to be dimorphic, as they are in at least some lobsters in which there is a "crushing-" and a "cutting-claw." Although I may be in error

Table 2.—Comparison of features of representatives of three South American crayfish genera.

Feature	*V. araucanius*	*S. spinifrons*	*P. pugnax*	*P. nicoleti*
Telson	calcified; with median sulcus & marginal spines	partly calcified, flexible; no median sulcus; with marginal spines	calcified; with median sulcus & marginal spines	calcified; with median sulcus; no marginal spines
Rostrum	reduced	long	reduced	reduced
Postorbital ridges	absent	well developed	present	absent
Cervical groove	V-shaped	U-shaped	V-shaped	V-shaped
Branchiocardiac groove	not joining cervical	joining cervical	joining cervical	joining cervical
Eyes	reduced	large	small	small
Mandible*	quadricuspide, nodular cusp on proximal side of triangle	quadricuspide, nodular cusp on distal side of triangle	bicuspide	bicuspide
Sternite XIII	with posteromedian plate	with long, digitiform projection	without caudal prominence	without caudal prominence
Sternite XIV	with deep median fissure	lacking median fissure	with deep median fissure	with deep median fissure
Mxp. III	sparsely setose, with band of tubercles	densely setose, no tubercles	sparsely setose, no tubercles	sparsely setose, no tubercles
Coxae XIV	close together, width about 2 × height	far apart, width < 2 × height	close together, width much < 2 × height	close together, width coxae much < 2 × height
Phallus	long	short	tuberculiform	tuberculiform
♂ cuticle partition	absent	present	present	present
Genital apertures	male or female	male or female	male and female	male and female
Chela: lateral margin dactyl	with tubercles row of mesial tubercles motion subhorizontal	without tubercles few mesial tubercles motion subhorizontal	few tubercles no mesial tubercles motion subvertical	2 rows of tubercles few mesial tubercles motion subvertical
Branchiae	20 + ep + r	20 + ep + r	20 + epr + r	20 + epr + r(?)
Habitat	burrows	open water	burrows	burrows

* Triangle of caudal molar process.

in doubting that such a dimorphic state exists in this crayfish, I am inclined toward the same opinion I expressed (Hobbs 1987: 8) after examining as many specimens of *Astacoides* as were available and concluded that the smaller cheliped in all members of that genus are ones that had been lost and regenerated.

Unfortunately, I have been able to examine only three specimens of *V. araucanius*: the holotype possesses chelae of unequal size, the left, interpreted by me to be a regenerate, much smaller than the right; the Valdivia male has only one chela (Fig. 3l); and the female aso has two chelipeds, but the smaller of the two has, in my opinion, all the characteristics of a regenerated appendage. To my knowledge, the existence of dimorphic chelipeds in which neither appendage has been regenerated has not been established for any astacoidean.

Although probably as closely allied to *Samastacus spinifrons* (Philippi, 1882) as to any other extant crayfish, among the many

features that serve to distingish *V. araucanius* from it are those listed in Table 2. That little reduction in the abdomen of the latter exists is rather surprising in view of the presence of other features that are frequently, if not usually, associated with a largely fossorial existence. Some, and perhaps even most, of the differences listed between them, as well as between them and two sympatric members of the genus *Parastacus,* conceivably might be either primarily or secondarily correlated with the habitats occupied by them: *S. spinifrons* principally occupying open water, and *V. araucanius* largely confined to burrows. But the differences in the phallic papillae and the associated features of the coxae bearing them, as well as the median structures of sternite XIII and perhaps those noted in the telson, were probably little influenced in their divergence by environmental factors.

Because the retention of these crayfishes in a common genus suggests to me a closer affinity between them than is warranted on the basis of our current understanding of the South American parastacids, the assignment of Faxon's *Parastacus araucanius* to a monotypic genus seems preferable to its current taxonomic position.

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